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Please replace paragraph [0031] with the following amended paragraph:

[0031]   The present invention is further described in the detailed description that follows, by reference to the noted drawings by way of non-limiting examples of preferred embodiments of the present invention, in which like reference numerals represent similar parts throughout several views of the drawings, and in which:

Fig. 1 is diagram of a wireless mobile routing system that includes a host network server, multiple wireless networks, and multiple mobile routing devices;

Fig. 2 illustrates a general overview of the mobile client side of the wireless mobile routing system that includes a mobile router;

Fig. 3 illustrates a software architecture for a host network server;

Fig. 4 is a flow chart showing an exemplary process executed by the host network server for processing incoming data received on a wireless network;

Fig. 5 shows an exemplary route table;

Figs. 6, 7, and 8 are flow charts showing exemplary logic executed by the host network server for processing outgoing data;

Fig. 9 shows an exemplary software architecture for the mobile router in an initial state;

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Fig. 10 shows an exemplary software architecture for the mobile router at a later state;

Fig. 11 shows an exemplary route registration packet;

Fig. 12 shows an exemplary graphical representation of port routing functionality, according to an aspect of the present invention;

Fig. 13 is an illustration of an exemplary port routing table having a variety of port routing configurations, according to an aspect of the present invention;

Fig. 14 is a flow diagram depicting an exemplary manner in which routes are registered, according to an aspect of the present invention;

Figs. 15(a) and 15(b) are flow diagrams depicting an exemplary manner in which routes are looked up when port routing is enabled, according to an aspect of the present invention;

Fig. 16 is screen shot showing an exemplary port routing configuration screen in which the mobile administrator has added five specific routes, according to an aspect of the present invention;

Fig. 17 is a screen shot of an exemplary port routing configuration screen which allows editing of port routing entries, according to an aspect of the present invention; and

Figs. 18(a) and 18(b) are screen shots of exemplary route table displays, according to an aspect of the present invention;

Fig. 19 illustrates a general overview of another embodiment of the present

invention which includes a mobile router in accordance with an aspect of the present

invention;

Fig. 20 illustrates a schematic block diagram of the mobile router in accordance

with an aspect of the present invention;

Fig. 21 is an illustration of a block diagram of the functional components of the

router in accordance with an aspect of the present invention;

Fig. 22 is an illustration of a block diagram of the switch within the router

according to the present invention;

Fig. 23 is an illustration of a flow chart of the processing steps used by the router

to initialize and build tables stored in the Router in accordance with an aspect of the

present invention;

Fig. 24 is a flow chart of the processing steps used by the router for checking

availability of each network interface in accordance with an aspect of the present

invention;

Fig. 25 is a flow chart of the processing steps used by the router to account the

availability of the channels and the user's configuration in order to decide which channel

to use for transporting data in accordance with an aspect of the present invention;

Fig. 26 is a flow chart of the processing steps used by the router for an error handler in accordance with an aspect of the present invention; and

Fig. 27 is an illustration of the software architecture of the Router in accordance with an embodiment of the present invention.

Please add the following new paragraphs after paragraph [0126]:

[0126.001]   Referring now to Fig. 19, therein is illustrated a general overview of another embodiment of the present invention which includes a mobile Router 200 in accordance with an aspect of the present invention. The Router 200 provides the mobile application or device 52 with the capability to selectively transmit and receive data over a plurality of radio frequency infrastructures 56 and/or the public switched telephone network 58 in accordance with user configured parameters.

[0126.002]   Referring now to Fig. 20, therein is illustrated a schematic block diagram of the mobile Router 200. In the following description of the Router 200, each of the elements will be initially generally described and in greater detail thereafter. As shown in Fig. 20, the mobile application or device 52 may be attached to multiple Networks by the Router 200 through Network Interfaces 214A-D, a Router Core 204, and a Switch 212. The Network Interfaces 214A-D provide connectivity for data between the Switch 212

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and the various Networks infrastructures (e.g., radio infrastructures 56 and public switch telephone network 58) through which the mobile device or application 52 connects to a communications network. The Switch 212 is actuated by the Router Core 204, and sends data to a fixed host application or device (e.g., RNC 20) via the selected network. The Network Interface 214 provides information to the Network Availability process 210, which sends this information to the Decision process 206. The Decision process 206 operates in accordance with User Configured parameters 208 which specify when and through which Network the data is to be transmitted. The decision process 206 monitors the User Configuration parameters 208, and the Network Availability 210. When the Decision process 206 (in accordance with User Configuration 208 parameters) specifies that a Network (e.g., Network 3) different than the Network currently in use (e.g., Network 1) should be used, the Decision process 206 checks the Network Availability 210 for the particular Network to be switched to. If the Network is available, the Decision process 206 instructs the Router Core 204 to switch to the new Network. The Router Core 204 then updates routing tables (not shown) maintained within the Router Core 204 to reflect the new data path, and actuates the Switch 212 to connect to the new Network. Data may then flow over the new Network. In accordance with an aspect of the present invention, data may flow inbound to the fixed host through one Network, and

outbound to the remote mobile Application or device 52 through the same Network, or through a different Network.

[0126.003]   With reference to Fig. 20, the mobile application or device 52 may comprise a software application running on a portable or laptop computer performing a variety of functions as programmed by the software application (e.g., database services). The Application or device 52 may also comprise a special purpose device designed to perform a particular function, such as a credit card reader or barcode scanner. The Application or device 52 may generate a data stream which is sent to a fixed location (e.g., a host computer infrastructure 10).

[0126.004]   An exemplary application running on the mobile device 52 is a mobile remote client application which provides the remote user with the capability to send and retrieve data from a fixed database server application. The data may consist of customer records which, for example, may be used by service personnel operating a fleet of vehicles to service customers scattered about a wide geographic area. In the exemplary application, the mobile client application may request customer records from the fixed database server, and display the records for viewing by mobile service personnel. The mobile client application may send updated records to the fixed database as the service personnel finish assigned tasks. The updated records may contain a service history, equipment upgrades, and repairs for each customer.

[0126.005]   Another exemplary application running on the mobile device 52 may be a

client application which retrieves a list of dispatched jobs to be performed by the service

personnel during each day. The jobs may be uploaded to the remote mobile device 52

each morning and stored in another client application in the mobile device 52. As the

service personnel change job locations, the status of each job may be updated to indicate a

status, e.g., en route, arrived and finished with comments. The status may be sent from

the application to the fixed home office, so a dispatcher at the home office is aware of the

locations of service personnel in the field.

[0126.006]   By way of non-limiting examples, the mobile device 52 may comprise a

portable or laptop computer; a computer having an embedded Router 200; a terminal or

terminal emulator; a data gathering device (e.g., a SCADA system or remote telemetry

system for obtaining data from a remote location for forwarding to a central location for

processing); a card-swipe reader device (e.g., credit/debit/bank cards) for use in a mobile

billing application, such as a taxi or mobile food cart; a smart-card reader; a logging

device, such as those used in a package delivery system or fleet; a device for reading bar

codes (e.g., for inventory control); and a remote application with data to send or to

receive, from a fixed application or device (e.g., remote diagnostic tool). The

above-noted applications are provided merely for exemplary purpose, and other

applications and mobile devices 52 may be used with the Router 200 of the present invention.

[0126.007] Typically the device or Application 52 sends and receives data using a variety of protocols (e.g., Internet Protocol (IP) / transparent (via MDC 54) / ack-nack, etc.). The use of a variety of protocols provides for open transport of data throughout many networks, and in particular, networks which support open standards such as IP. However, many proprietary networks which require interface and/or protocol translation remain in use. In the Router 200 of the present embodiment, the function of interfacing with networks and protocol translation may be performed by the Network Interfaces 214A-D.

[0126.008] According to another aspect of the invention, other types of devices may be connected to the Network Interface 214. Such devices may be used for functions other than data and voice communication. By way of non-limiting examples, these devices may include Global Positioning System (GPS) receivers and application processors.

[0126.009] The Router Core 204 is a function which shuttles messages between the Application or Device 52 and the various Networks. In accordance with the present embodiment, the router Core 204 may control which network of a plurality of usable network messages are to travel over, and connect access ports (described below) to each Network and the Application or Device 52.

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[0126.010]   The Router Core 204 may also comprise a list of all possible "names" or

"addresses" to which data may be sent, or from which data may be received. The local

"names" or "addresses" of the Router Core 204 are stored in tables within a memory (not

shown) of the Router Core 204. Thus, the Router Core 204 may serve as a

communications "address book" for the Router 200 of the present embodiment. The

Router Core 204 also checks all messages passing through, and decides, based on the

address and/or name entries in the tables, if the message is relevant to the attached

Application or Device 52, or to the fixed host (e.g., RNC 20). The address of the fixed

host may be stored in the Router Core table as well. In accordance with the table entries,

received messages may be determined to be valid or invalid. The Router Core 204 may

also actuate the Switch 212 in accordance with the output of the decision process 206.

The Switch 212 is actuated such that incoming and outgoing messages can be sent

through the "current" network, as determined by the decision function 206 (to be

described below).

[0126.011]   The Switch 212 may comprise a message multiplexor, i.e., the Switch 212

performs a one-to-many function for in-bound messages (to the fixed hosts), and a

"many-to-one" function for outbound messages (from the fixed host). As noted above,

the appropriate network selection is made by the Router Core 204 in accordance with the

output of the decision process 206. Messages travel through the Switch 212, the Router Core 204, and the current Network Interface 214.

[0126.012]   Referring to Fig. 22, the Switch 212 may be implemented using a combination of hardware (e.g., multiple electronic ports, one per Network Interface 214) to perform the physical connection process 212B, and software (e.g., handlers which are interrupted at each character to move the character to either the Router Core 204 (outbound), or to the current Network Interface 214 (in-bound)) to perform the switch logic process 212A.

[0126.013]   As a non-limiting exemplary hardware implementation, the Switch 212 may comprise an 80386EX microprocessor, running at 33 MHZ, 256 kilobytes of FLASH ROM, 512 kilobytes of static RAM, six asynchronous serial ports, two TTL-to-RS232 convertors interfacing with two of the six serial ports directly to compatible devices external to the Switch 212, and four internal TTL serial interfaces to internally-mounted daughter boards, which carry Network Interfaces 214A-D. Each Network Interface 214 mounted on a daughter board may include a power supply for the Network Interface, a serial interface to the 80386EX microprocessor, and an interface to the outside network. The outside network may be a radio, a LAN, an antenna (for internally-mounted radios in the Network Interface 214), or other device accepting or supplying data from/to the Router 200.

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[0126.014]   The Switching function of the Switch 212 is provided by each serial

Network Interface port at the 80386EX microprocessor, and the software residing in

FLASH ROM. The software logic determines which Network Interface to use for

transmission and receipt of data. The decision is implemented in the Switch, by selecting

a physical serial port (and therefore which Network Interface) is to be used as the current

Network. The Decision software in the FLASH ROM instructs the microprocessor to

send the data to a specific serial port (which is mapped to specific physical addresses

within the address range of the 80386EX microprocessor). The microprocessor then

constructs the next message in the message buffers in RAM, and sends the message

through the specific serial port which is designated as the "current Network" Interface

port. The data then goes to the Network Interface (e.g., network interface 214A)

connected to that specific serial port and on to the Network infrastructure. Received data

is input to the Network Interface (e.g., network interface 214B which may be set to the

"current Network" serial port) and the microprocessor, where the received data is

processed by the microprocessor. In accordance with an aspect of the present invention,

messages which are received through Network Interfaces which are not designated as the

"current Network" are ignored.

[0126.015]   The Network Interfaces 214A-D are devices which present data to, or

obtain data from the radio operating at the various R.F. Network frequencies, bandwidths,

and modulations. The Network Interfaces 214A-D may provide a port through which messages pass, to and from the Switch 212. The messages are typically in the form of a sequence of serial digital bits. The Network Interfaces 214A-D also may provide a modulator/demodulator function which transforms the digital data into an analog form which may be easily sent through the R.F. Network voicepath, based on characteristics of the assigned frequency band of the R.F. Network. The characteristics of analog transmissions are typically bandwidth (in Hertz, or cycles per second), noise present in the Network, and assigned frequency of the R.F. Network. Further, the Network Interfaces may interface with a radio, which may be included within the Network Interface 214, or may be mounted externally to the Router 200 (as shown in Fig. 19). The Network interface 214 radio interface comprises the actual physical connections to the radio for the voicepath data, the muting function (if present and/or required) and the functionality for issuing a Press-to-Talk to the radio, and for receiving the Transmit Grant signal from the radio; both are used for handshaking between the radio network and the Network Interface 214. This handshaking may be necessary for proper timing of the data out onto the RF Network. The muting function is used for silencing received signals which represent data, rather than voice traffic, which enables a remote user to mute the audible noise of the data traffic, which can be annoying to the remote user.

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[0126.016]   Examples of Network Interface 214A-D include the MDC 54 and the

NovaTel Wireless NRM-6812 Cellular Digital Packet Data (CDPD) modem. Where the

network interface 214 comprises the MDC 54, the radio is mounted external to the MDC

54, whereas in the NovaTel example, the radio and the network interface are integrated

into a single unit.

[0126.017]   As noted above, the Network Interfaces 214 provide connections to various

types of networks. These networks may be wired (for example Public Switched

Telephone Network 58), or wireless (for example Cellular Digital Packet Data (CDPD)).

The following non-limiting list includes networks that may be interfaced to the Router

200 by the Network Interfaces 214A-D: private voice radio including conventional and

trunked radios (e.g., using MDC 54), Cellular Digital Packet Data (CDPD), Spread

Spectrum (e.g., direct sequence and channel-hop), GSM, GPS receiver, satellite

transponder, RDI (Ericsson) interface, AMPS, RAM Mobile (Mobitex), RS232, RS485,

Angel (AT&T), Asynchronous Transfer Method (ATM), Integrated Services Digital

Network (ISDN), public switched telephone network (PSTN (POTS) telephone network),

Ethernet, Ardis, Personal Communications Services (PCS), and any other network which

is either transparent or operates using a specific protocol.

[0126.018]   The specific protocols to the above-listed networks are implemented in the

Network Interfaces 214A-D. These protocols may be very different, and therefore

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incompatible with each other. Additionally, a translation device may be provided in each

Network Interface 214 to translate between IP and the particular network protocol. By

providing such a translation device, the Application or Device 52 can use IP data

regardless of the particular network the Application or Device 52 is actually using.

[0126.019]   Referring to Fig. 21, a description of the functional components of the

Router 200 will now be described. The Router 20 may be implemented as an autonomous

device with multiple connections to the networks through which data is to be routed. The

user Configuration Interface 208 provides a means whereby an external device such as a

keyboard/terminal may be used to supply configuration information such as preferred

routes, network node addresses, etc. to the router. Such information is accepted by the

Configuration Interface 208 and is placed into a non-volatile store (e.g., memory) which

may be queried by other router components. In addition, capability may be provided

whereby diagnostic information may be requested from the router and sent to the terminal

device for evaluation by a technician.

[0126.020]   The Router Core 204 is responsible for making all routing decisions. For a

given destination network address specified within a data packet or datagram received

from one of the network interface drivers 215A-D, the most-preferred path will be

selected and the data packet or datagram forwarded through the preferred network

interface driver 215A-D. Routing decisions are generally based upon such metrics as

network speed and interface availability. Other metrics such as destination network, time of day, type of data, etc. may also be incorporated into the routing decision. Further, routing decisions may be made at the packet level such that each individual packet of data may be transmitted and/or received on different networks in accordance with the user configured parameters 208.

[0126.021]   Exemplary Network Drivers 215A-D may include an Ethernet Driver, a Token-Ring Driver, and a Serial PPP Driver. The Ethernet Driver provides a means for sending and receiving data through an Ethernet-type network. The function of the driver is to shield the Router Core from the details of network media access. The Token-Ring Driver provides a means for sending and receiving data through a Token-Ring-type network. The function of the driver is to shield the Router Core from the details of network media access. The Serial PPP Driver provides a means for sending and receiving data through a PPP-based serial data link. The function of the driver is to shield the Router Core from the details of network media access. Other drivers 215A-D may be provided to interface with other types of networks as necessary.

[0126.022]   The Network Availability 210 (see also Fig. 20) is a function which periodically interrogates each installed Network Interface 214 in the Router 200 and may determine if the Network Interface 214 is installed; if the Network Interface 214 is properly configured and functioning properly; if the Network Interface 214 is connected

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to the Network, on-line, and available for sending/receiving messages; and if the Network Interface 214 is in good health. The above interrogation process may be accomplished by monitoring a timer tick (provided by the switch microprocessor), which instructs the Network Availability 210 to query each Network Interface 214. When the timer tick occurs, the Network Availability 210 function interrogates each Network Interface 214 as noted above. The status of each Network Interface 214 is then passed to the Decision process 206, which determines what the "next Network" will be if the result of the interrogation indicates that the "current Network" is experiencing transmission problems.

[0126.023]   The Network Availability 210 of each Network Interface 214 is determined in a manner specific to the particular interfaced Network. For example, if the Network is CDPD, the Network Availability 210 interrogates the network to determine if the Network Interface 214 is currently registered with the Network, and therefore active. Also, in the CDPD network, the Network Availability 214 determines if the Received Signal Strength Indication (RSSI) is sufficient to transmit relatively error-free data. For example, in the NovaTel CDPD Network Interface a RSSI of -100 dBm will provide for good data transmission qualities. Thus, if the Network Availability 210 function queries the NovaTel CDPD Network Interface for the RSSI, and the response is -110 dBm, then the signal is too weak for error-free transmission, and therefore cannot be used at this time. This information is passed to the Decision process 206 to determine if the "current

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Network" should remain the "current Network", and if not, to determine what the "next Network" should be.

[0126.024] The User Configuration 208 block is used to define user configurable parameters by which the Router Core 204 selects the "current Network" and the "next Network". The Router parameters may include the date and time (e.g., yr-mo-da, hh:mm:ss), and the Network Interface 214 installed in each of the internal slots of the Router 200. According to the present embodiment there are six internal slots to accommodate Network Interfaces to any of private voice radio using e.g., the MDC 54 and a variety of radios, both conventional and trunked; Cellular Digital Packet Data (CDPD), such as Sierra Wireless or NovaTel CDPD modems; spread spectrum, either direct sequence, or channel-hop, as Xetron Hummingbird spread spectrum modem; GSM, such as Ericsson serial GSM module; GPS receiver, such as Motorola VP Encore GPS receiver, or Trimble SVEE Six receiver; satellite transponder; RDI (e.g., Ericsson) interface, implemented via a software protocol module and quasi-RS232 interface to radio; AMPS; RAM Mobile (e.g., Mobitex); RS232 default and fixed for example in slots 1 and 2; RS485; Angel (e.g., AT&T); ATM; ISDN; PSTN; Ethernet; Ardis; PCS; any other network which is either transparent or operates using a specific protocol; and none. Although six slots are disclosed herein, other numbers of slots may be provided.

[0126.025]   Other user configurable parameters include: the priority of each internal

slot, (e.g., 1 to 6) where the slot with priority 1 is the default startup slot and Network;

baud rate of each slot (a default rate may be set to 9600 bits per second, but may be

configured to be any standard baud rate, divisible by 300, up to 115.2 kilo bits per

second); cost per kilobyte per slot (e.g., $0.xx per kilobyte where the least costly slot that

is available and highest priority will be default); protocol per slot (e.g., none, Point to

Point (PPP), Serial Line Internet Protocol (SLIP), Hayes "AT" commands, transparent);

slot mode, for example, transparent, PSTN, cellular, IP, receive only; slot name or address

or phone number; slot to be used for diagnostics (e.g., default may be set to slot 2); slot

muting to be used (e.g., none, PL, DTMF, other); number of retry transmissions per

Network Interface (per slot) before declaration of Network Interface failure (e.g, 0-10); if

slot Network Interface needs to be configured before it can operate (e.g., y,n); slot to be

used for remote display (e.g., default may be set to slot 2); slot to be used for Device or

Application 52 (e.g., a connection to a mobile computer; default is slot 1); and frequency

at which Network Availability 210 is checked (e.g., default may be set to five seconds).

Other user configurable parameters may be introduced and configured as necessary.

[0126.026]   The User Configuration 208 function provides the user with the capability

to instruct the Router 200 how to select a particular Network. These metrics may include,

but are not limited to: which Network is connected to which Router port, time of day and

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date, priority (switching sequence) of each Network, cost per packet of each Network, and preferred default Network.

[0126.027] On power up, the User Configuration 208 is checked to determine if it is current. If the User Configuration 208 is determined to be out of date, the end user is requested to input a configuration. The user is notified by blinking LEDs on the front panel or by a message sent to the mobile device 52. If the User Configuration 208 is determined to be current, no user input is requested.

[0126.028] Further, each Network is continuously evaluated for health and connectivity status. There are a number of parameters which are examined to determine this, including, but not limited to: Received Signal Strength Indication (RSSI), Clear to Send (CTS), Channel Clear/Channel Ready, and Transmit Grant.

[0126.029] The Decision process 206 continuously examines the User Configured parameters in the user configuration block 208, to determine the next Network to use, in case the current Network becomes unavailable to send or receive data. Such an unavailability may arise because the remote user (and consequently the Router 200) has moved beyond coverage of the Network, or because a problem has occurred with the current Network or the Network Interface 214.

[0126.030] After the Decision process 206 has determined the next Network to use, the decision process 206 queries the Network Availability 210. If the next Network is

available, then the Decision process 206 updates the routing tables in the Router Core 204. The Router Core 204 will then actuate the Switch 212 to physically connect the next Network as the current Network.

[0126.031]   The Decision process 206 uses the User Configuration 208 parameters defined above to determine the specific criteria for each slot, to be used when deciding if the current Network is to remain the current Network, and if not, what the next Network shall be. Once the decision process 206 has made a tentative decision to switch to another Network (i.e., the next network is to become the current network), it checks the Network Availability 210 to ascertain if the Network is actually installed, configured, on-line, and in good health. For example, if the current Network is configured as priority #3, and the Network Availability 210 of the priority #2 Network updates to, for example, "installed, configured, on-line, and in good health", then the priority #2 Network becomes the next Network. The Decision process 206 will instruct the Switch 212 to switch the priority #2 Network to the current network. Should the Decision process 206 decide to change Networks, it conveys an instruction to the Router Core 204 by instructing the Router Core 204 what the next Network Interface 214 is to be.

[0126.032]   The process of the Decision process 206 checking the User Configuration 208 and the Network Availability 210 continues indefinitely, and is described in detail in Figs. 23-26. Generally, the process helps to guarantee that the mobile user always has

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access to a Network for sending and receiving data. This process also allows what is known now as "seamless roaming". This means that the mobile user can move between Networks and continue to have reliable data transmission on the different Networks.

[0126.033]   Figs. 23-26 illustrate the logic of the software in the router. Referring now to Fig. 23, there is shown an exemplary initialization routine which builds the tables in the Router 200. Upon initialization of the system, at Step 310 the first channel priority is checked. At Step 312, it is determined whether or not the first channel is being examined. If it is the first channel, at Step 314, table entries for the first channel are built. Information which is included in the table may be, e.g., IP address of the destination, intervening intermediate IP addresses, the assigned port, channel priorities, and the application being used. Typically channel one is assigned the highest priority. After the tables are built, the processing increments to the next channel at step 316. From Step 316, processing returns to Step 312. If at Step 312 it is determined that the channel being checked is not the first channel, processing proceeds to Step 320 to query whether all channels have been checked. If all channels have not been checked, processing returns to Step 314 to continue building the table entries via steps 314 and 316 until all channels have been checked.

[0126.034]   Once it has been determined that all channels have been checked, at Step 322 it is determined whether any tables have been built. If no tables have been built, at

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Step 324 a configuration error is recognized and the processing stops. Tables may not have been built previously, e.g., if there are problems with the IP address, i.e., there was no destination address. If at Step 322 it is determined tables were already built, processing proceeds to Step 326 where all channels are initialized and data transportation begins via the first channel.

[0126.035] From Step 326 the processing proceeds to Step 328, also shown in Fig. 25, which illustrates an exemplary flow diagram of the Router 200 logic for accounting the Network Availability 210 (Fig. 20) and User Configuration 208 (Fig. 20) to decide which channels to use for data transport. Beginning at Step 328, processing proceeds to Step 330 where the channel is set to the current channel in a database which is described in more detail below. From there, processing proceeds to Step 332 to retrieve the next channel to switch to from the database. The database is stored in flash memory and contains configuration information for each channel including how each channel is set up in the Router 200 and what configuration values are for each Network Interface 214A-D. In addition, the database stores which channel is current and the history of previous current channels. The tables discussed with reference to Fig. 23 at Step 314 are also stored in the database.

[0126.036] At step 334 a determination is made as to whether the previous channel is available. Of course if this is the first time through, no previous channel will exist. If the

previous channel is not available, at Step 336 a determination is made as to whether the next channel is available. If the next channel is available, at Step 338 a determination is made as to whether or not the priority is lower and it is time to switch. The determination is made by looking at the information in the User Configuration 208 (Fig. 20). If it is time to switch, at Step 340 a switch to the next channel is made. From there, processing continues to step 341, where it is determined if the channel was switched. If the channel was switched, processing continues to step 343 where a ping is sent to confirm the path is available. From step 343, the processing continues to Step 342, also shown in Fig. 24. If, at step 341, it is determined the channel was not switched, processing continues to step 342.

[0126.037]   Returning to Step 334, if it is determined that a previous channel is available, at Step 344 an inquiry is made as to whether or not the previous channel has a higher priority and it is time to switch. The determination is made by consulting the information in the User Configuration 208 (Fig. 20). If it is determined the previous channel is a higher priority and it is time to switch, at Step 346 a switch to the previous channel is made. From Step 346, the processing proceeds to Step 341 as previously described.

[0126.038]   If at Step 344 it is determined that it is not time to switch and the priority is not higher, processing proceeds to Step 336 where it is determined whether the next

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channel is available. If the next channel is not available, at Step 348 the current channel

is not switched and the processing proceeds to Step 341 as described above. If at Step

336 the next channel is available, then at Step 338 the inquiry into priority and time to

switch is made as previously described. At Step 338, if it is not time to switch and the

priority of the next channel is not lower, the Router 200 stays on the current channel at

Step 348.

[0126.039]   Refer now to Fig. 24 which illustrates a flow chart of exemplary logic for

checking the availability of each network interface. Starting at Step 342 processing

proceeds to Step 344 where the status of the channel being used is recorded in the

database. Furthermore, at Step 344, the Router 200 front panel LED's are updated. If at

Step 346 it is determined the availability of all channels has not been checked, at Step 348

the next channel is identified and at Step 350 the next channel's availability is polled. A

channel is not available if it is being used for a mobile device 52 i.e. the channel is

already one end of the network. If the channel is not available, the processing returns to

step 348. If the channel is determined to be available at step 350, processing proceeds to

Step 328 also shown in Fig. 25.

[0126.040]   If at Step 346 it is determined that the availability of all channels has been

checked, at Step 352 the availability of the present channel is determined. If the present

channel is available, a connection is made at Step 354. If the present channel is not

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available, processing proceeds to Step 356 for error handling. The error handling procedure is discussed with reference to Fig. 26 below. Upon completion of the error handling procedure, at Step 360 the channel is set equal to one at Step 362. At Step 350, the procedure continues as previously described.

[0126.041] Referring now to Fig. 26, which is an exemplary flow diagram of the Router 200 error handling logic, Step 356 continues from Fig. 24. At Step 370, the present channel is deemed to be non-available. At Step 372, the next and previous channels are also confirmed to be non-available. At Step 374 an error is indicated to the device or application. At Step 376 an availability routine is run such as that described previously. From the availability routine at Step 36, the processing continues to Step 360 as discussed with reference to Fig. 24.

[0126.042] The Router 200 of the present invention may be used inside a mobile vehicle, or carried by a person in a portable application. Further, the Router 200 may be provided as an external component connected to a portable device (e.g., a laptop computer) or may be implemented within the portable device, such that the portable device and the Router 200 are provided as one integrated unit. Further, the Router 200 may be used in conjunction with, or integrated into measuring and testing equipment, and transmission equipment. Such a remote device may be needed for very remote

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monitoring applications, such as wildlife studies, etc., necessitating the use of multiple Networks.

[0126.043]   Referring now to Fig. 27, there is shown the software architecture 219 of the Router 200 in accordance with an embodiment of the present invention. The architecture is strictly layered in that data flows only vertically between adjacent layers. The definition of each layer will now be described.

[0126.044]   The Application layer consists of various processes that perform services directly related to the function(s) for which the device is defined. This includes such services as defining a device configuration, making decisions about which route to select for the transport of data and performing various diagnostic functions.

[0126.045]   The Presentation layer consists of a protocol-independent insulating layer between the applications and the lower-level networking functions. The Presentation layer implements a Berkley sockets compliant application programming interface (API).

[0126.046]   The Networking layer performs all processing related to handling the Internet Protocol (IP). The main function of the networking layer in this environment is the routing of data passed into the layer from either above or below back out through selected Network Interfaces to deliver that data to the intended destination. The relationship of destination and network interface is maintained by the Configuration Module and Routing Decision Module applications.

[0126.047] The Data-Link layer provides logical Network Interfaces through which the Networking Layer may send and receive data. One or more of these Network Interfaces may be active at any time. At least one network interface must be active for the device to function properly. The main purpose of the Data-Link layer is to insulate the Networking layer from the details of the many link-level protocols used to transport data.

[0126.048] The Device-Specific layer deals with the details of establishing and maintaining data communications through various types of communication devices such as radios, modems and data controllers. Each Device-Specific driver handles the vagaries of configuring and interfacing with various types of communication devices while presenting a uniform interface to the Data-Link layer.

[0126.049] The Physical Interface layer handles the direct interface to external components. For example: A serial port driver may handle the sending and receiving of individual data bytes through a specific type of serial controller such as an Intel 8250.

[0126.050] A description of the functionality supported by various module blocks as presented in Fig. 27 will now be described.

[0126.051] The Configuration Module 222 is an Application layer module that allows a technician to maintain a database of device configuration information. A technician may access the Configuration Module via a diagnostic serial port. Another implementation

may allow a technician to access the Configuration module through any of the defined Network Interfaces via a standard socket.

[0126.052] The Routing Decision Module 220 selects the preferred network interface through which outbound data is transmitted. This decision is based upon a variety of metrics including: Interface availability; Time of day; Type of service required; Interface priority and others. Examples of various routing metric schemes are presented later.

[0126.053] The TCP/IP Socket Interface 224 supports an Application Programming Interface (API) which, for example, conforms to the standard Berkley sockets paradigm. Its purpose is to shield the Application Layer from the details of the underlying networking protocols. It allows different network implementations to be employed without the applications being required to adapt.

[0126.054] The TCP/IP Router/Gateway 226 implements standard IP host support with the additional capability of being able to act as a gateway between multiple networks. IP datagrams received by this layer that are not destined for a local IP host address are forwarded through the network interface that is currently designated as the preferred route for the given destination address. It is possible that the management and selection of preferred routes is implemented by the Routing Decision Module 220 in the Application layer.

[0126.055]   The PPP Protocol Driver 228 provides a network interface whose data-link protocol conforms to the Point-To-Point protocol standard. The SLIP Protocol Driver 230 provides a network interface whose data-link protocol conforms to the Serial-Line Internet Protocol de facto standard. Other protocol drivers 230 may be implemented which provide Network Interfaces which support either existing protocols or future protocols. The intent is to convey that the underlying link-layer protocol is transparent to the upper and lower layers and that additional protocols may be easily supported.

[0126.056]   The MDC Interface Driver 234 provides device-specific support for Mobile Data Controller 54, as described above. The CDPD Interface Driver 236 provides device-specific support for a Cellular Digital Packet Data controller. Other device-specific drivers, e.g., Modem "X" Interface Driver 238 may be implemented to support current or future devices.

[0126.057]   The Serial Port Driver 240 deals with the hardware aspects of asynchronous serial data communications such as manipulating a Serial I/O controller or other such external interface. Other physical layer drivers 242 may be implemented which support different external interface devices either existing or in the future.

[0126.058]   For example, the router of the present invention may be included as an internal component of the mobile device, proving for an integrated mobile device. Optionally, the router may be implemented entirely as a software process running on, for

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example, a portable personal computer. In such an implemention, the internal slot(s) of

the personal computer may be provided with network interface(s) and a software program

may serve as the router core. Further, data may be routed to the different networks at

another level than at the packet level. For example, entire messages may be routed over

various networks if such a configuration is required.

Please delete paragraph [0128]

31.